IUPUI

**SCHOOL OF INFORMATICS
AND COMPUTING**

DEPARTMENT OF BIOHEALTH INFORMATICS

Indiana University–Purdue University
Indianapolis

INFO-B 518 Applied Statistical Methods for Biomedical Informatics

Credit Hours	3	
Time and Location	Thu 18:00–20:40	IT 167
Instructor	Jiaping Zheng	
Email	jizhen@iu.edu	
Office Hours	Thu 13:00 to 14:30	

Description

The ability to understand, analyze, and interpret biomedical data is integral to biomedicine. This course provides basic data analysis skills and hands-on experience in scrutinizing biomedical data.

Objectives

- Students will understand the need for biostatistics.

- Students will distinguish different data types.

- Students will be able to generate summaries of data.

- Students will be able to explain probability and basic probability distributions.

- Students will learn to use the software packages to perform statistical analysis.

Reference Books

- Julie Vu, David Harrington, *Introductory Statistics for the Life and Biomedical Sciences*, 1st ed., OpenIntro, 2020.

Additional reading materials will be posted on Canvas.

Learning objectives:

Course objective	AMIA functional domains	Proposed competency driven objectives	Miller's Pyramid (map)	Class Activities	Assessment
1. Identify and interpret massive health data with missing values	F2	Students will be able to analyze data down to the smallest detail, such as missing values.	KNOWS HOW	Quizzes	Homework assignments, Exam
2. Infer and justify inferences from health data specific to diseases	F4	Students will be able to make inferences from disease-specific health data and justify them.	KNOWS HOW	Quizzes	Homework assignments, Exam
3. Correlate massive phenotypic and genotypic data	F4	Students will be able to analyze and correlate large amounts of phenotypic and genotypic data.	KNOWS HOW	Quizzes	Homework assignments, Exam
4. Determine and model population, sampling and hypothesis testing for specific diseases	F4	For specific diseases, students will learn how to determine and model population, sampling, and hypothesis testing.	KNOWS HOW	Quizzes	Homework assignments, Exam
5. Design and formulate sampling and hypothesis testing for hospital and Insurance data to evaluate the complexities	F4	To analyze the difficulties, students will be able to design and develop sample and hypothesis testing for hospital and insurance data.	DOES	Quizzes	Homework assignments, Exam
6. Select and generate regression analysis and other statistical analysis for precision medicine applications	F2	Students will be able to understand and apply the analysis methods.	SHOWS HOW	Quizzes	Homework assignments, Exam
7. Outline and formulate paper presentation	F9	students will learn how to Outline and develop a paper presentation	SHOWS HOW	Quizzes, Class Project, Paper presentation	Homework assignments, Exam
8. Construct and rearrange project design, writing, analysis, and presentation	F9	Students will build a unique design and make necessary changes to the current plans according to the condition.	DOES	Quizzes, Class Project, Paper presentation	Homework assignments, Exam
9. Develop and revise programs to perform data analytics on large, complex datasets in R	F2	Students will be able to create code for many types of datasets and manage a wide range of datasets.	DOES	Quizzes, Class Project, Paper presentation	Homework assignments, Exam

Grading and Course Evaluation

Grade breakdown

- Homework assignments (30%)

- Quizzes (10%)

- Exams (30%)

- Paper presentation (10%)

- Final group project (20%)

Scale

A+	97–100	Outstanding achievement, given at the instructor's discretion
A	93–100	Excellent achievement
A-	90–92	Very good performance and quality of work
B+	87–89	Good performance and quality of work
B	83–86	Modestly acceptable performance and quality of work
B-	80–82	Marginal acceptable performance and quality of work
C+	77–79	Unacceptable work (Core course must be repeated for credit)
C	73–79	Unacceptable work (Core course must be repeated for credit)
C-	70–72	Unacceptable work (Course must be repeated for credit)
D+	67–69	Unacceptable work (Course must be repeated for credit)
D	63–66	Unacceptable work (Course must be repeated for credit)
D-	60–62	Unacceptable work (Course must be repeated for credit)
F	0–60	Unacceptable work (Course must be repeated for credit)

Course Logistics

Canvas, the Indiana University online teaching resource, will be used for this course. Students will be given instructions to use Canvas after they enroll. All communication will be initiated from Canvas, so correctly specifying your email address and setting up the mail forward feature is critical for communication. Use the Canvas messaging feature to communicate with the instructor so your emails do not get lost. Under rare circumstances, if you need to email the instructor directly, please *include 'B518' in the subject line*.

Course Policy

Homework assignment

All homework assignments will be available shortly after class on Canvas and are due before class begins *electronically in PDF format only or in source code* on Canvas. No paper copies or email copies will be accepted, unless there is a Canvas system malfunction or prior arrangements with the instructor are made.

The assignments are to be done by each student individually. Discussions of the questions are allowed, but the discussion may not include specific answers to any of the questions.

If your homework is submitted late, each 24 hour incurs a 10% deduction. If your submission is late by over 72 hours, no credit will be given.

Quizzes and Exams

Quizzes are handed out in class and need to be completed in class, and there are two exams.

Group Project and Paper Presentation

Students work in groups of 3 to 4 to complete a project that applies the methods from the class. Students will also work in groups to present a research paper that analyzes biomedical data.

Course Schedule

The following is a tentative schedule.

W	Date	Topic(s)
1	01/13/22	Course Introduction
2	01/20/22	Introduction to Data
3	01/27/22	Probability 1
4	02/03/22	Probability 2
5	02/10/22	Probability Distributions
6	02/17/22	Inference 1
7	02/24/22	Inference 2
8	03/03/22	Exam 1
9	03/10/22	Linear Regression 1
10	03/17/22	Spring Break
11	03/24/22	Linear Regression 2
12	03/31/22	Categorical Data 1
13	04/07/22	Categorical Data 2
14	04/14/22	Exam 2
15	04/21/22	Final presentation 1
16	04/28/22	Final presentation 2

Other Policies

Administrative withdrawal

If you miss more than half of the required activities within the first 25% of the course without contacting the instructor, you may be administratively withdrawn from this course. See the campus policy page https://studentcentral.iupui.edu/register/administrative-withdrawal.htmlfor more.

Academic misconduct

All students should aspire to the highest standards of academic integrity. Using another student's work on an assignment, cheating on a test, not quoting or citing references correctly, or any other form of dishonesty or plagiarism shall result in a grade of zero on the item and possibly an F in the course. Incidences of academic misconduct shall be referred to the Department Chair and repeated violations shall result in dismissal from the program. See the student code page http://studentcode.iu.edu/responsibilities/academic-misconduct.html for more.

Mission Statement

The Mission of IUPUI is to provide for its constituent's excellence in

- Teaching and Learning

- Research, Scholarship, and Creative Activity

- Civic Engagement

With each of these core activities characterized by

- Collaboration within and across disciplines and with the community

- A commitment to ensuring diversity, and

- Pursuit of best practices

IUPUI's mission is derived from and aligned with the principal components—Communities of Learning, Responsibilities of Excellence, Accountability and Best Practices—of Indiana University's Strategic Directions Charter.

Statement of Values

IUPUI values the commitment of students to learning; of faculty to the highest standards of teaching, scholarship, and service; and of staff to the highest standards of service. IUPUI recognizes study dents as partners in learning. IUPUI values the opportunities afforded by its location in Indiana's capital city and is committed to serving the needs of its community. Thus, IUPUI students, faculty, and staff are involved in the community, both to provide educational programs and patient care and to apply learning to community needs through service. As a leader in fostering collaborative relationships, IUPUI values collegiality, cooperation, creativity, innovation, and entrepreneurship as well as honesty, integrity, and support for open inquiry and dissemination of findings. IUPUI is committed to the personal and professional development of its students, faculty, and staff and to continuous improvement of its programs and services.